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FORMAL EDUCATION:

Ph.D.	Mathematics, Courant Institute of Mathematical Sciences, NYU, 1976
M.S.	Computer Science/Mathematics, Courant Institute, NYU, 1974
B.S.	Physics, Tulane University, 1972 (cum laude with Honors)
B.S.	Mathematics, Tulane University, 1972 (cum laude with Honors)

THESIS: "The Method of Lines Solution of Partial Differential Equations," written under the guidance of Prof. Peter D. Lax.

RESEARCH INTERESTS: The development and analysis of numerical methods and software for the solution of partial differential equations.

EMPLOYMENT HISTORY:

1998-Present	Los Alamos DOE Program Manager in Applied Mathematics (MICS)
1985–Present	Group Leader, LANL Mathematical Modeling and Analysis Group T-7.
1988–Present	Adjunct Professor of Mathematics, University of Arizona.
1986–1988	Administrative Manager, LANL Advanced Computing Facility.
1982–Present	Executive Council, Center for Nonlinear Studies, LANL.
1982–1983	Associate Chairman, Center for Nonlinear Studies, LANL.
1980–1985	Deputy Group Leader, LANL Mathematical Modeling and Analysis.
1976–Present	Research Staff, LANL, Mathematical Modeling and Analysis.
1972–1976	Research Assistant, Courant Institute of Mathematical Sciences, NYU.
1975–Summer	Los Alamos Scientific Laboratory, digital image enhancement.
1974–Summer	Los Alamos Scientific Laboratory, mathematical immunology.
1972–Summer	Lawrence Livermore Laboratory, atmospheric pollution.

CURRENT ACTIVITIES:

2001	Co-Chair of the SIAM Annual Meeting
1998–Present	Vice President of the Society for Industrial and Applied Mathematics (SIAM) for Publications
1998–Present	Member of SIAM Council
1998–Present	Chair of the SIAM Board of Editors-in-Chief
1998–Present	Chair of the SIAM Committee on Science Policy
1996–Present	Member of the Scientific Program Advisory Committee for the NSF Institute for Mathematics and its Applications
1993–Present	Editor of the International J. of Computers and Mathematics
1990–1998	Editor of the SIAM J. on Scientific Computing
1989–Present	Editor for International Journal of High-Speed Computing

PAST ACTIVITIES:

2000	Co-organizer with Misha Shashkov, Joel Dendy, Len Margolin, Blair Swartz for the Conference on Systems of Conservation Laws and Related Topics
1999	Co-organizer with James Cavendish for the NSF/IMA Conference on Decision Making under Uncertainty: Assessment of the Reliability of Mathematical Models
1999	Co-organizer with David Sharp, Shiyi Chen, Sallie Keller-McNulty, Len Margolin, and Timothy Trucano for the DOE Workshop on Predictability of Complex Phenomena
1999	Co-organizer for the II PanAmerican Workshop: Applied and Computational Mathematics
1999	Co-organizer with Shiyi Chen and Weinan E for the CNLS Workshop on Incompressible Fluid Flows: Numerical Methods and Applications
1997	Organizer/Chairman CNLS Conference on Nonlinear Waves and Solitons in Physical Systems
1995–1998	Member of the Council of the AMS
1995–1996	Member of the Committee on Eduction of the AMS
1995–1996	AMS Committee on Publications
1996–1998	AMS Committee on Meetings and Conferences
1995	Member of NSF Committee on Visitor Review Panel for the New Technologies Program
1995	Co-organizer with Misha Shashkov on CNLS Workshop using Knowledge Engineering and Computer Algebra to Write Complex Computer Programs
1995	Co-organizer with P. Deift, P. Holmes, D. Levermore, D. McLaughlin and E. Wayne for the Annual AMS-SIAM Summer Program: Dynamical Systems and Probabilistic Methods for Nonlinear Waves
1993	Co-Organizer/Chairman with D. Holm and W. Newman of the CNLS Annual Conference on Modeling the Forces of Nature
1993–1999	Member of the Board of Trustees for SIAM
1992–1999	Editor-in-Chief of the SIAM J. on Scientific Computing
1992–1994	Chairman of the Joint AMS-SIAM Committee on Applied Mathematics
1992–1994	Member of the AMS Task Force on Education, Industry, & Government Interactions
1992–1995	Member of the Board of Governors for the NSF Institute for Mathematics and its Applications
1992	Organizer/Chairman of the SIAM, Annual Conference 1992
1991	Organizer/Chairman of CNLS Annual Conference on Experimental Mathematics: Computational Issues in Nonlinear Science
1990	Co-Organizer/Chairman with D. Campbell and R. Ecke of the CNLS Annual Conference on Nonlinear Science: The Next Decade
1989	Co-organizer with J. R. Buchler of the NATO Advanced Research Workshop on the Modeling of Nonlinear Stellar Pulsations

1988–1992	National Academy of Sciences NRC/NIST Panel for Computing and Applied Mathematics
1988–1991	Vice-chairman of Society of Industrial and Applied Mathematics Special Interest Group in Supercomputing
1988–1992	SIAM Committee on Committees and Appointments
1988–1991	Treasurer of SIAM Special Interest Group on Dynamical Systems
1987–1995	Editor for International Journal of Supercomputer Applications
1987–1991	Mathematical Association of America State of the OSTP Workshop to develop recommendations for a National Scientific Effort on AIDS Modeling and Epidemiology
1987	Co-chairman with Ann Stanley for CNLS Conference on Nonlinear Systems of Parabolic PDEs
1986	Ten-hour lecture series on "Blending Analysis and Numerics for Solving PDEs," University of California Summer School on " Experimental Mathematics: Computation and Discovery in Nonlinear Science "
1982–1985	National Academy of Sciences Committee on Applications of Mathematics. Co-authored the Committee's report Computational Modeling and Mathematics Applied to the Physical Sciences
1984	Co-chairman, AMS-SIAM two-week Summer Seminar on Systems of Nonlinear Partial Differential Equations
1983	Co-chairman, CNLS Conference on Implicit Methods for PDEs
1982	Co-chairman with R. Kirkpatrick and B. Sitt, CEA/Los Alamos meeting on Hydrodynamic Shock Waves and Instabilities
1981	Chairman, CNLS Adaptive Mesh Methods Conference, Los Alamos
	Referee for professional journals and granting agencies: J. Comp. Phys., SIAM J. Sci. and Stat. Comp., SIAM J. Num. Anal., AIAA, Phys. of Fluids, Phys. Lett. A., NSF, DOE-BES/AMS, ARO, AFOSR, and NIH.

PUBLICATIONS AND SELECTED REPORTS:

Books Edited:

1. **Nonlinear Waves and Solitons in Physical Systems**, editor with R. Camassa and B. Luce, North-Holland, North-Holland (1998). Also published as a special issue of Physica **D 123** (1998).

2. **Modeling the Forces of Nature**, editor with R. Camassa and W. Newman, North-Holland, 1994. Also published as a special issue of Physica **D 77** (1994).

3. **Experimental Mathematics: Computational Issues**, in Nonlinear Science, North-Holland (1992). Also published as a special issue of Physica **D** (1992).

4. **Nonlinear Science: The Next Decade**, with D. Campbell and R. Ecke, North-Holland (1991). Also published as a special issue of Physica **D** (1991).

5. **Nonlinear Systems of Partial Differential Equations in Applied Mathematics Part 2**, with D. D. Holm and B. Nicolaenko, Lectures in Applied Mathematics, Vol. **23**,

Vol. **I**, American Mathematical Society, Providence, RI (1986).

6. **Nonlinear Systems of Partial Differential Equations in Applied Mathematics Part 1**, with D. D. Holm and B. Nicolaenko, Lectures in Applied Mathematics, Vol. **23**, Vol. **II**, American Mathematical Society, Providence, RI (1986).

Research Publications:
(Recent papers available at http://math.lanl.gov/∼mac/papers)

1. "Validity of Asymptotic Models for Water Waves," with W. Choi and Y. A. Li, in review (2001).

2. "Mimetic Finite Difference Operators for Second-Order Tensors on Unstructured Grids," with J. C. Campbell and M. J. Shashkov, to appear Computers Math. with Applications (2001).

3. "An Adaptive Moving Mesh Method with Static Rezoning for Partial Differential Equations," with S. Li and L. Petzold, submitted, special volume of Lecture Notes in Computational Science and Engineering, Springer, 2001.

4. "Mimetic Finite Difference Methods for Maxwell's Equations and the Equations of Magnetic Diffusion," with M. Shashkov, Prog. in Electromagnetic Research, PIER **32**, (2001), 89-121.

5. "The Effect of Inner Products for Discrete Vector Fields on the Accuracy of Mimetic Finite Difference Methods," with M. Shashkov, and S. Steinberg, to appear Computers Math. with Applications (2001).

6. "Compacton Solutions in a Class of Generalized Fifth Order KdV Equations," with F. Cooper and A. Khare, to appear Phys. Rev. E (2001).

7. "Mimetic Finite Difference Methods for Maxwell's Equations and the Equations of Magnetic Diffusion," with M. Shashkov, J. of Electromagn. Waves and Appl., Vol. 15, No. 1, 107-108 (2001).

8. "Fourth and Sixth-Order Conservative Finite Difference Approximations of the Divergence and Gradient," with J. Castillo, M. Shashkov, and S. Steinberg, Appl. Numerical Math., **37** (2001), 171-187.

9. "The Initialization and Sensitivity of Multigroup Models for the Transmission of HIV," with with J. Li and E. A. Stanley, J. Theor. Biology **208**, (2001) 1-23

10. "The Origin of AIDS Darwinian or Lamarkian?," with T. Burr, and G. Myers, Phil. Trans. R. Soc. Lond. **B** (2001) **356**, 1-10.

11. "The Impact of Random Screening and Contact Tracing in Reducing the Spread of AIDS," with with J. Li and E. A. Stanley, Los Alamos Report LA-UR-99-5351 to appear Mathematical Biosciences (2001).

12. "Stability, Relaxation, and Oscillation of Bidegradation Fronts," with J. Xin, SIAM J. Appl. Math. **61** (2000), no. 2, 472–505

13. "An Algorithm to Align a Quadrilateral Grid with Internal Boundaries," with S. Li, P. Knupp and M. Shashkov, J. Comp. Physics, **163**, No. 1, (2000) 133-149

14. "Impacts of Misspecifying the Evolutionary Model in Phylogenetic Tree Estimation," with T. Burr, and G. Myers, and A. Skourikhine, Proceedings of the International Conference on Mathematics and Engineering Techniques in Medicine and Biological Sciences,pp. 481-487 (2000)

15. "An Intuitive Formulation for the Reproductive Number for the Spread of Diseases in Heterogeneous Populations," with J. Li, Math. Biosciences **167**, No. 1, (2000) 65-86

16. "Sensitivity Studies of the Differential Infectivity and Staged Progression Models for the Transmission of HIV," with with J. Li and E. A. Stanley, Los Alamos Report LA-UR-99-2253 (1999).

17. "Dynamical Evolution of Planetesimals in the Outer Solar System. II. The Saturn/Uranus and Uranus/Neptune Zone," with K. R. Grazier, W. I. Newman,and W. M. Kaula, ICARUS **140**, 353-368 (1999).

18. "Dynamical Evolution of Planetesimals in the Outer Solar System. I. The Jupiter/Saturn Zone," with K. R. Grazier, W. I. Newman,and W. M. Kaula, ICARUS **140**, 341-352 (1999).

19. "Mimetic Discretizations for Maxwell's Equations," with M. Shashkov, J. of Comp. Physics. **151**, No. 2, 881-909 (1999)

20. "An Adaptive Moving Mesh Method with Static Rezoning for Partial Differential Equations," with S. Li and L. R. Petzold, Los Alamos Report LA-UR-98-5465 (1999), in review.

21. "Interactive and Dynamic Control of Adaptive Mesh Refinement," with S. Li, Los Alamos Report LA-UR-98-5462 (1999), in review.

22. "An Adaptive Mesh Refinement Method for Two Dimensional PDEs," with S. Li, Los Alamos Report LA-UR-98-5463 (1998)

23. "An Adaptive Moving Mesh Method with Locally Refined Nested Grids for PDEs," with S. Li, Los Alamos Report LA-UR-98-5460 (1999), in review.

24. "The Differentiated Infectivity and Staged Progression Models for the Transmission of HIV," with J. Li and E. A. Stanley, Mathematical Biosciences **155**, no. 2 (1999) 77-109

25. "The Orthogonal Decomposition Theorems for Mimetic Finite Difference Methods," with M. Shashkov, SIAM J on Numerical Analysis, **36**, No. 3, 788-818 (1999)

26. "Nonlinear Waves and Solitons in Physical Systems," with R. Camassa and B. Luce, Physica D **123** no. 1-4, (1998) 1-20

27. "Pulsating Multiplet Solutions of Quintic Wave Equations," with P. Rosenau, Physica D **123** (1998) 502-512

28. "Mimetic Discretizations for Maxwell's equations and the equations of magnetic diffusion," with M. Shashkov, Mathematical and Numerical Aspects of Wave Propagations, J. A. DeSanto, ed., (SIAM, Philadelphia, 1998), 561-563.

29. "The Approximation of Boundary Conditions for Mimetic Finite Difference Methods," with M. Shashkov, Computers and Mathematics with Applications, **36**, no. 5, 79-99, (1998).

30. "The Black Box Multigrid Numerical Homogenization Algorithm," with J. E. Dendy, Jr. and J. D. Moulton, J. of Comp. Physics, **142**, 80-108 (1998)

31. "The Adjoint Operators for the Natural Discretizations for the Divergence, Gradient, and Curl on Logically Rectangular Grids," with M. Shashkov, Applied Numerical Math.**25**, 413-442, (1997)

32. "Numerical Simulations and Mimetic Discretizations for Maxwell's equations and the equations of magnetic diffusion, " with M. Shashkov, Los Alamos Report LA-UR-97-5158 (1997).

33. "The Differentiated Infectivity Model for the Transmission of HIV," with J. Li and E. A. Stanley, Los Alamos Report LA-UR-97- (1997).

34. "Natural Discretizations for the Divergence, Gradient, and Curl on Logically Rectangular Grids," with M. Shashkov, Computers Math Applic. **33**, no. 4, 81-104, (1997).

35. "Energy stability bounds on convective heat transport: Numerical study," with C. R. Doering, Phys. Rev. E, **55**, no. 6, 7775-7778, (1997).

36. "Modeling the Effectiveness of Isolation Strategies in Preventing STD Epidemics," with J. Li. SIAM Journal of Applied Mathematics, **58**, no. 3, 912-913 (1998).

37. "Behavior Changes in SIS STD Models with Selective Mixing," with J. Li. SIAM Journal of Applied Mathematics, **57**, No. 4, 1082-1094, (1997).

38. "Disease Transmission Models with Biased Partnership Selection," with J. Li. Applied Numerical Mathematics, **24**, No. 2-3, pp 379-392, (1997).

39. "Problems with Heterogeneous and Non-Isotropic Media or Distorted Grids," with M. Shashkov and S. Steinberg, Finite Volumes for Complex Applications, F. Benkhaldoun and R. Vilsmeier (eds.), Hermes Press, Paris, pp, 249-260, (1996).

40. "The Numerical Solution of Diffusion Problems in Strongly Heterogenous Non-Isotropic Materials," with M. Shashkov and S. Steinberg. JCP, 132, No. 1, 130-148, (1996).

41. "Biased Preference Models for Partnership Formation," with J. Li. World Congress of Nonlinear Analysts, pp. 3137-3148, (1996).

42. "Heterosexual Spread of HIV with Biased Sexual Partner Selection," with E. A. Stanley. Models for Infectious Human Diseases, V. Isham and G. Medley, eds. Cambridge Press (1996) 274-278.

43. "Multidimensional Methods for Hyperbolic Problems," with M. Shashkov, B. Swartz and B. Wendroff. Los Alamos Report LA-UR-96-1026 (1996).

44. "High-Order Mimetic Finite Difference Methods on Nonuniform Grids," with J. Castillo, M. Shashkov, and S. Steinberg. ICOSHOM.95. Houston J. of Mathematics. A. Ilin and R. Scott eds. (1996) 347-362.

45. "The Sensitivity and Accuracy of Fourth Order Finite-Difference Schemes on Nonuniform Grids in One Dimension," with J. Castillo, M. Shashkov, and S. Steinberg. Computers Math. with Applications, **30**, No. 8, pp. 41-55 (1995).

46. "An Exhaustive Search for Stable Orbits in the Outer Solar System," with K.R. Grazier, W. I. Newman, W. M. Kaula, and F. Varadi, DDA95 - Dynamical Astronomy, Yosemite, CA - B.A.A.S Vol. 24, no. 2, (1995).

47. "Mappings and Integraters on the Edge of Chaos," with K. R. Grazier, W. I. Newman,and W. M. Kaula, 25th DDA meeting, Yosemite, CA - B.A.A.S **21**, no. 2, (1995).

48. "A Risk-based Heterosexual Model for the AIDS Epidemic with Biased Sexual Partner Selection," with E. A. Stanley, in Modeling the AIDS Epidemic, E. Kaplan and M. Brandeau, eds. Raven Press (1994) 331-364.

49. "New Wave mathematics," with Rosenau P., What's Happening in the Mathematical Sciences **2**, ed. B. Cipra, **30**, (1994), 14-18.

50. "A New Integrable Shallow Water Equation," with Camassa, R., and D. Holm and J. M. Hyman, Advances in Applied Mechanics, **30**, (1994), 1-33.

51. "A Divide and Conquer Algorithm for Grid Generation," with R. Dougherty, Applied Numerical Math., **14** (1994) 125-134.

52. "Threshold Conditions for the Spread of the HIV Infection in Age-Structured Populations of Homosexual Men," with J. Li and E. A. Stanley, J. Theo. Biology, **166**, (1994) 9-31.

53. "Long Term Integrations of the Solar System: Simplicity beats Simplexity," with R.E. Bell, K.R. Grazier, W. I. Newman,and W. M. Kaula, DDA94 - Dynamical Astronomy, Kingsville TX- B.A.A.S **26**, no. 2, (1994).

54. "The Compacton: a Soliton with Compact Support," with P. Rosenau, Phys. Rev. Letters **70**, No. 5, (1993) 564-567.

55. "Mathematical Foundations of High-Performance Computing and Communications," co-author with the panel on the Mathematical Sciences in HPCC, NRC (1992).

56. "Rash Theory," with Klaus, A. Perelson, and L. Segel,Theoretical and Experimental Insights into Immunology, (1992), A. Perelson, G. Weisbuch and A. Continho, eds. Springer Verlag.

57. "Bounded and Unbounded Patterns of the Benney Equation," with P. Rosenau and A. Oron, Phys. Fluids **A** (6) (1992) 125-134.

58. "High Order Finite Volume Approximations of Differential Operators on Nonuniform Grids," with R. J. Knapp and J. C. Scovel, Physica **D** 60 (1992) 112-138.

59. "Calculating Realistic Error Bounds Using Significance Arithmetic with Dependency Tracking," Los Alamos Report (1992).

60. "Identifying Coherent Structures in Nonlinear Wave Propagation," with W. I. Newman and D. K. Campbell, Chaos, **1**, No. **1**, 77–94 (1991).

61. "A Shock Wave Driven by a Phased Implosion," with R. Menikoff, S. A. Colgate, N. L. Johnson, K. Lackner.and G. Miranda, Phys. Fluids **A**, **3** (1), (1991), 201–218.

62. "Local Mimetic Difference Schemes: Algebraic Topology in Numerical Analysis," with J. C. Scovel, Los Alamos report (1991).

63. "Finding Threshold Conditions for Epidemiological Models," with E. A. Stanley and J. Li, Los Alamos National Laboratory report LA-UR-90-1967.

64. "A Mathematical Analysis of Threshold Conditions for Heterogeneous Epidemiological Models," with E. A. Stanley and J. Li, Los Alamos National Laboratory report LA-UR-90-3561.

65. "Design of Gifthorse," with R. Menikoff, K. Lackner, N. Johnson, and S. Colgate, Defense Science (1990).

66. "An Algorithm for Finding Roots of Functions Using Clustering Methods," with D. J. Goldstein and S. N. Kerr, Los Alamos report (1990).

67. "Numerical Methodologies for Solving Partial Differential Equations," The Numerical Modelling of Nonlinear Stellar Pulsations, R. Buchler Ed., Kluwer Acad. Pub. (1990), 215–237.

68. "Numerical Results of the Risk-Based Model," with E. A. Stanley, Los Alamos Science No. **18** (1989) 28–35.

69. "The Seeding Wave," with S. A. Colgate, Los Alamos Science No. **18** (1989) 36–39.

70. "AIDS and a Risk-Based Model," with S. A. Colgate, E. A. Stanley, C. R. Qualls and S. P. Layne, Los Alamos Science No. **18** (1989) 2–33.

71. "Modeling the AIDS Epidemic," with S. A. Colgate and E. A. Stanley. Society of Industrial and Applied Mathematics News **22**, No. **3** (1989) 1, 8–10.

72. "Risk Behavior-Based Model for the Cubic Growth of Acquired Immunodeficiency Syndrome in the United States" with S. A. Colgate, E. A. Stanley, S. P. Layne and C. R. Qualls, Proc. Natl. Acad. Sci. USA, **86** (1989) 4793–4797.

73. "The Effects of Social Mixing Patterns on the Spread of AIDS," with E. A. Stanley, Mathematical Approaches to Problems in Resource Management and Epidemiology,(Ithaca, NY, 1987), 190-219, Lecture notes in Biomath., 81, C. Castillo-Chavez, S. A. Levin, and C. A. Shoemaker (Eds.), Springer, Berlin (1989).

74. "Dynamic Rezone Methods for Partial DifferentialEquations in One Space Dimension," with B. Larrouturou, Appl. Numerical Math. **5** (1989) 435–450.

75. "Nonnegativity-, Monotonicity-, or Convexity-Preserving Cubic and Quintic Hermite Interpolation," with R. L. Dougherty and A. S. Edelman, Math. Comp. **52**, No. **186** (1989), 471–494.

76. "Building Large-Scale Models to Understand the AIDS Epidemic," with E. A. Stanley, S. A. Colgate, and S. P. Layne, Cray Channels, **10**, No. **3** (1988) 10–12.

77. "Mathematical Research in the Soviet Union with Practical Applications," with W. A. Beyer, D. D. Holm, B. Nichols, and P. R. Stein, Los Alamos National Laboratory report LA-11335-MS (1988).

78. "The Need for National HIV Databases," with S. A. Colgate, S. P. Layne, T. G. Marr and E. A. Stanley, Nature, **333** (1988) 511–512.

79. "Static Rezone Methods on Logically Rectangular Grids," with W. D. Henshaw, Los Alamos National Laboratory report LA-UR-88-345 (1988).

80. "Using Mathematical Models to Understand the AIDS Epidemic," with E. A. Stanley, Math. Biosci. **90** (1988), 415–473.

81. "Evolution of Solidification Front of a Dilute Binary Alloy: A New Asymptotic Approach," with A. Novick-Cohen and P. Rosenau, Phys. Rev. **B**, **37**, No. **13** (1988), 7603–7608.

82. "On the Use of Adaptive Moving Grid Methods in Combustion Problems,"with B. Larrouturou, to appear in Modeling of Chemical Reaction Systems, Heidelberg, Germany (1988).

83. "Significance Arithmetic with Dependency Tracking," Los Alamos Report (1988).

84. "Moving Mesh methods for Partial Differential Equations, "Mathematics Applied to Science (New Orleans 1986), 129-153, Academic Press, Boston, MA (1988).

85. "A Behavior Based Model of the Initial Growth of AIDS in the United States," with S. A. Colgate, S. P. Layne and E. A. Stanley, Los Alamos National Laboratory report LA-UR-87-3412, (1987).

86. "On the Quasi-continuous Approximation of the Toda Lattice," with P. Rosenau, Physics Letters **A**, **124** (1987), 287–289.

87. "Piecing Together the AIDS Puzzle," with E. A. Stanley, Los Alamos National Laboratory Research Highlights (1987), 60–61.

88. "Coherence and Chaos in the Kuramoto-Velarde Equation," with B. Nicolaenko, Directions in Partial Differential Equations, E. M. Crandall, P. Rabinowitz and R. Turner, Eds., Academic Press (1987), 89–111.

89. "Coherence and Chaos on Unstable Flame Fronts," with B. Nicolaenko, Los Alamos Research and Development 1985, Los Alamos National Laboratory report LA-10600 (1986) 71–74.

90. "Nonlinear Pattern Selection in a Mechanical Model for Morphogenesis," with A. Perelson, P. Maini, J. Murray, and G. Oster, J. Math. Biol. (1986) **24:**525–541.

91. "Order and Complexity in the Kuramoto-Sivashinsky Model of Weakly Turbulent Interfaces," with B. Nicolaenko and S. Zaleski, Physica **23D** (1986) 265–292.

92. "Analysis of Nonlinear Parabolic Equations Modeling Plasma Diffusion Across a Magnetic Field," with P. Rosenau, Lectures in Appl. Math., **23** (1986), 216–245.

93. "The Kuramoto-Sivashinsky Equation: A Bridge Between PDES and Dynamical Systems," with B. Nicolaenko, Physica **18D** (1986), 113–126.

94. "Plasma Diffusion Across a Magnetic Field," with P. Rosenau, Physica **20D** (1986) 444–446.

95. "Analysis of Nonlinear Mass and Energy Diffusion," with P. Rosenau, Physical Review A, **32**, No. **4** (1985), 2370–2373.

96. "Discrete Approximations to the Divergence and Gradient Operators," with J. C. Scovel, Los Alamos National Laboratory report (1985).

97. "Adaptive Static Rezoning Methods," with M. Naughton, Lectures in Applied Mathematics, **22**, Part **I** (1985) 321–343.

98. "Static Rezone methods for Tensor-Product Grids, with M. J. Naughton Large-scale computations in fluid mechanics, Part 1 (La Jolla, Calif., 1983), 321-343, Lectures in Appl. Math., 22-1, American Math Society Providence, RI., (1985).

99. "Significance Arithmetic for Calculations with Uncertainties in the Data," Los Alamos National Laboratory report (1984).

100. "High-order Incomplete Factorizations of Sparse Matricies," with T. A. Manteuffel, Advances in Computer Methods for Partial Differential Equations, V. R. Vichnevetsky and R. S. Stepleman, Eds., Pub. IMACS - (1984), 551–555.

101. "Moving Mesh Methods for Initial Boundary Value Problems," Los Alamos National Laboratory report LA-UR-84-61 (1984).

102. "Scientific Computing on Tomorrow's Supercomputers," IEEE Distributed Processing special issue of Distributed Systems Architecture, **6**, No. SI-1, 84–91 (1984).

103. "Numerical Methods for Tracking Interfaces," Physica **12D** (1984) 396–407.

104. "Dynamic Acceleration of Nonlinear Iterations," with T. A. Manteuffel, Elliptic Problem Solvers Conference **II**, G. Birkhoff, Ed., Academic Press (1984) 301–313.

105. "Future Directions in Large-Scale Scientific Computations," Large Scale Scientific Computation, S. V. Parter, Ed., Academic Press (1984) 51–84.

106. "Diffusion Patterns of a Confined Plasma," with P. Rosenau, Los Alamos National Laboratory report LA-9943-MS (1983).

107. "RWMOD: Read/Write Routines for Arrays in FORTRAN Programs," with R. Y. Hayes, Los Alamos National Laboratory report LA-UR-83-2664 (1983).

108. Interview: "What's Happening Now $\cdots$ in the Kerr Years," published in Los Alamos Science, Winter/Spring (1983), No. **7**, p. 94–109.

109. "Adaptive Moving Mesh Methods for Partial Differential Equations," Advances in Reactor Computations, American Nuclear Society Press, La Grange Park, IL (1983) 24–43.

110. "Computational Modeling and Mathematics Applications of Mathematics, co-author with W. C. Rheinboldt, J. G. Glimm, R. J. Kee, Jr., J. A. Krumhansl, J. E. Osborn, M. H. Schultz, I. Stakgold, National Academy Press (1983).

111. "On Davydov's alpha-Helix Solitons," with D. W. McLaughlin and A. C. Scott, Long-Time Prediction in Dynamics, edited by C. W. Horton, Jr., et al, John Wiley & Sons (1983), 367–394.

112. "Self-Adjusting Grid for One-Dimensional Hyperbolic Conservation Laws," with A. Harten, J. Comp. Phys. **50**, No. **2**, (May 1983), 235–269.

113. "Accurate Monotonicity Preserving Cubic Interpolation," Society of Industrial and Applied Mathematics Journal of Scientific and Statistical Computing, **4**, No. **4**, (December 1983) 645–654.

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115. "FORSIG: A Extension of FORTRAN with Significance Arithmetic," Los Alamos report LA-9448-MS (1982).

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117. "Dynamic Rezoning Methods," Proceedings of the CEA/Los Alamos Meeting on Hydrodynamic Shock Waves and Instabilities, **II**, R. C. Kirkpatrick and B. Sitt, Eds., (1982) 24.1–24.19.

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119. "A Note on Time Step Changes Using Implicit ODE Methods," Los Alamos report No. LA-UR-81-2361 (1981).

120. "DERMOD: A Subroutine Package for the Numerical Differentiation of Discrete Functions I. Polynomial Interpolation Methods," with B. Larrouturou, Los Alamos National Laboratory report LA-9122 (1981). Also published in French by Ecole Nationale des Points et Chaussess (1981).

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OTHER REPORTS:

Co-authored 43 Los Alamos Classified reports on analytical and numerical methods analyzing shock waves in non-weapons inertial fusion systems. Most are joint with S. A. Colgate.

SELECTED COMPUTER CODES:

MOL1D (1976) General purpose method of lines subroutine package for the solution of systems of initial boundary value partial differential equations in one space dimension; FORTRAN - 4,200 lines.

PDE1D (1978) Fully vectorized general purpose explicit PDE package for solving hyperbolic systems of initial value problems. These routines are much faster than MOL1D and require one-third the memory; FORTRAN - 1,200 lines.

PDE2D (1979) 2-D version of PDE1D; FORTRAN - 2,200 lines.

PLT1T (1979) High-level interactive graphics plotting package for the Tektronix series 40XX terminals; FORTRAN - 1,800 lines.

PDE1A (1980) Revision of PDE1D that accommodates adaptive meshes and highly interactive graphics; FORTRAN - 3,800 lines.

EOSMOD (1981) with M. Klein, High-level interface for interpolating the SESAME equations-of-state and opacity tables; FORTRAN - 3,500 lines.

DERMOD (1981) Vectorized subroutine package for the numerical differentiation of functions defined on a discrete mesh in 1, 2, and 3 dimensions using finite differences (with B. Larrouturou); Fourier and Chebyshev pseudospectral methods (with R. Dougherty); and finite volume methods (with C. Scovel); FORTRAN - 12,000 lines.

FORSIG (1981) A preprocessor and arithmetic library for an extension of FORTRAN that can account for the creation and propagation of errors in a computer program due to uncertainties in the data; SNOBOL - 700 lines; FORTRAN - 1,100 lines.

RWMOD (1983) (with R. Hayes) A portable input/output package to read or write 1, 2, and 3-dimensional arrays in a formatted or unformatted style; FORTRAN - 1,300 lines.

PLTN (1983) (with R. Dougherty) An interactive color plotting package to display multiple lines, contours, surfaces, grids, streamlines, and velocity vectors using the NCAR plotting routines; FORTRAN - 9,000 lines.

1 1/2-D Code (1977–1988) A sophisticated interactive computer program to approximate multimaterial fluid flows in a variable area cylindrical pipe system. The code is Lagrangian in r and Eulerian in z and makes extensive use of the EOSMOD, DERMOD, PDE1A, RWMOD, PLT1T, and PLTN packages; FORTRAN - 3,000 lines (31,000 lines when assembled).

ODEUM (1984) Automatic implementation of new temporal integration of numerical methods into a variable time step/variable order integration package for solving PDE's. The ODESA subpackage (written with L. MacNeil) provides sophisticated stability and accuracy analysis of the multistep multicycle integration methods that can be implemented in ODEUM; ALTRAN - 1,700 lines, FORTRAN - 3,800 lines.

SSMD (1985) High-level Multitasking routines to assist in converting FORTRAN programs to run on multiprocessing computers (with R. Dougherty); FORTRAN - 600 lines.

AIDS (1987) Simulation of the spread of the AIDS virus in a risk-based biased-mixing model of the U.S. homosexual population; FORTRAN - 4,000 lines.

DEMOD (1991) Automated solution of evolutionary partial differential equations in two and three space dimensions. FORTRAN - 13,000 lines.